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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 : H02B 1/18 — A1

(11) International Publication Number: WO 86/ 06221

(43) International Publication Date: 23 October 1986 (23.10.86)

(21) International Application Number: PCT/DK86/00041

(22) International Filing Date: 16 April 1986 (16.04.86)

(31) Priority Application Number: 1743/85

(32) Priority Date: 17 April 1985 (17.04.85)

(33) Priority Country: DK

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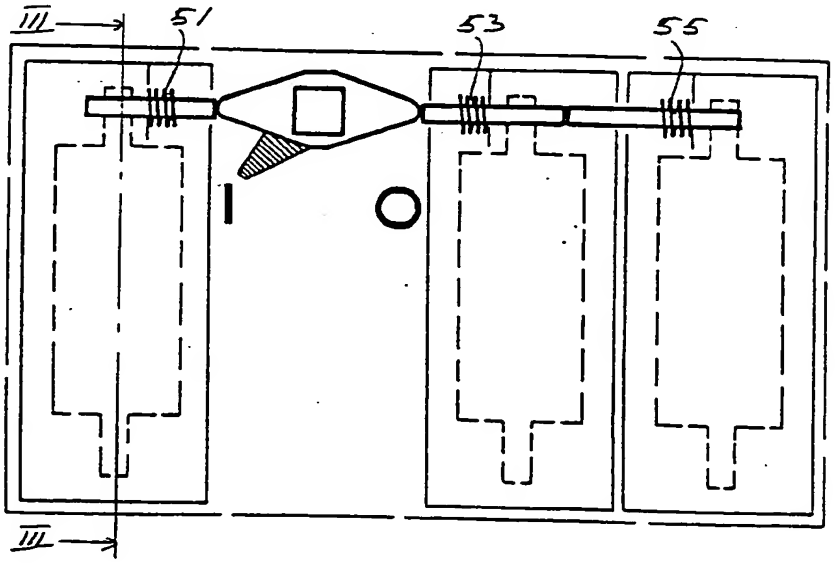
(81) Designated States: AT, AT (European patent), AU, BE (European patent), CH, CH (European patent), DE, DE (European patent), FI, FR (European patent), GB, GB (European patent), IT (European patent), LU, LU (European patent), NL, NL (European patent), NO, SE, SE (European patent).

Published
With international search report.
In English translation (filed in Danish).

(54) Title: A SAFETY DEVICE FOR SWITCHES

(57) Abstract

A safety device for use in connection with power switches comprises fuse boxes (17, 19, 21) for individual mounting on a breaker box (11) and shielding of a set of contact pieces (16) with associated knife fuses (23, 25). The fuse boxes are provided with barring pins (41, 43, 45) which by means of a common manoeuvring means (47) collectively can be brought into a barring position for the fuses (23, 25) when the switch is connected. When the switch is disconnected the barring pins are released and returned to a neutral position by means of return springs (51, 53, 55), in which position the fuses can freely be removed from and inserted into their respective contact pieces (16). Each box (17, 19, 21) is furthermore constructed with inner walls (29, 31, 33) for limiting the free movement of the fuse, and the contact safety is consequently increased. For each fuse box there is a cover (60) also functioning as a handle in connection with the insertion and removal of a fuse. The handle (60) comprises a closing handle (71) cooperating with the fuse vanes of a fuse to prevent an unintended release of the fuse and formed to be self-barring when the cover is inserted. The cover can consequently not be removed when the switch is disconnected, the barring pins barring the removal of the switch.



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Title: A Safety Device for Switches.

Technical Field

The present invention relates to a safety device for use in connection with power switches of a type known per se and comprising a substantially box-shaped breaker box with a number of one-sidedly located contact pieces which are in pairs intended to secure a fuse formed as a fuse body and two opposite terminal legs extending therefrom.

Background Art

Known switches of the above type are often only shielded by means of mounted plastic partitions between the fuses and their holders (the contact pieces), which has resulted in a construction of switch boards, where each switch is mounted below separate doors or covers, which can only be opened when the switch in question is disconnected. This will obviously increase the price of switchboards, the daily operation of which is difficult and time-consuming.

Switches with built-in safety devices are known preventing unauthorised access to live parts when the fuse has been mounted and the switch connected; however, no safety device is known, which, if desired, can be mounted as a separate unit on existing power switches of the above type and which can simultaneously offer the necessary safety.

Description of the Invention

A safety device according to the invention is characterised in that it comprises a number of fuse boxes for individual fastening on the breaker box and for shielding a set of contact pieces with associated fuse, a number of barring pins, one for each fuse box, displaceably located in the longitudinal direction of the breaker box against the

effect of a spring between a neutral position and a barring position, as well as a manoeuvring unit for collective operation of the barring pins either directly or indirectly, so that said barring pins in the in-position of the switch have been manoeuvred to said barring position and in the out-position of the switch to said neutral position, and in which each fuse box on the inside is constructed with inner walls in such a manner that the fuse concerned is given as narrow a passage as possible, which makes an oblique mounting of the fuse impossible, and in which the barring pins in the barring position make the removal of a fuse from, alternatively the insertion of a fuse into, its respective contact pieces impossible.

A safety device is hereby obtained which can easily be mounted as a separate unit on existing power switches and will consequently imply protection against the situation, where a impatient electrician is injured during an attempt of removing or inserting a fuse by means of an available unsuitable tool while the switch is connected. The safety device according to the invention prevents everybody from coming into contact at all with live parts in a connected switch via the terminal legs of the fuse by means of an inappropriate manipulation with the fuse, e.g. by an oblique insertion of the fuse into the fuse box. The space will prevent this.

A further embodiment of the safety device according to the invention is characterised by comprising a cover for each fuse box, said cover having a handle portion, a rigid and manually operated closing handle, which is resiliently movable from a rest position and which is provided in one end for cooperation with one of the fuse vanes placed on the fuse body and having carrier pins situated on the underside for engaging said fuse vanes for carrying said fuse, and besides said closing handle in a rest position bars the unintended sliding off of a fuse vane from a

carrier pin.

The closing handle may furthermore be constructed for self-barring when the cover has been mounted.

As a result maximum contact safety is achieved, which involves that the costs of construction in connection with the establishment of switch boards can be reduced, as the previously enforced requirement of only one switch behind one door can be modified without any risk. The placing of several switches behind the same door increases the accessibility in connection with service on switch boards considerably.

Brief Description of the Drawing

The invention will be described more detailed below with reference to the accompanying drawing, in which

Fig. 1 is a schematic top view of a safety device with the switch in out-position and the barring pins correspondingly in neutral position,

Fig. 2 illustrates the safety device of Fig. 1 but with the switch in in-position and the barring pins correspondingly in their barring position,

Fig. 3 is a sectional view along the line III-III of Fig. 2, in which the left part of the figure in full line illustrates a correctly inserted fuse with the switch connected, and in which the right part in dotted line illustrates a fuse, the insertion of which has been attempted with the switch connected,

Fig. 4 is a longitudinal sectional view of four stages of the connection between the cover of a fuse box and a fuse, and

Fig. 5 is a longitudinal sectional view of two stages in the disengagement of the fuse from the cover.

Description of the Preferred Embodiments of the Invention

The types of switches normally referred to in the present context pass by the name of quick-break switches, circuit interruptors or the like and are so well-known to the experts that the sketchy figures of the drawing are quite sufficient for explaining the present invention. For the sake of clarity the switch itself has only been indicated by an outer contour 11 and by an axle of the handle for the operating mechanism of the switch. A more detailed description of a switch of this well-known type is given in Danish Patent Application No. 5105/84 with the title: "Electric Switch" and No. 0161/85 with the title: "Breaker Box".

Furthermore, Fig. 1 of the drawing illustrates a position indicator 15 on the axle of the handle as well as markings for the in- and out-position, "I" and "O", respectively, of the switch.

A box-shaped shield, a fuse box, in Figs. 1 and 2 designated 17, 19, and 21, respectively, is positioned around each set of contact pieces, only indicated in Fig. 3 of the drawing at positions 16, there being a fuse box for each of the three phases normally available. A DIN-standardized knife fuse consisting of a fuse body 23 and a terminal leg 25 in each end is inserted into each box as indicated by dotted line.

The more detailed construction of the fuse boxes is illustrated in Fig. 3. Each fuse box comprises in particular an outer box 27 open at the top and the bottom; said outer box carries in the inner of the central third part a chamber for the fuse body 23, said chamber being substantially

U-shaped in section. The chamber is formed by two inner end walls 29 and a bottom wall 31. Each inner wall 29 is at the top connected to an outer end wall through a horizontal partition 33.

The mutual distance between the inner end walls 29 is only somewhat greater than the length of the fuse body 23, so that only little clearance d is left between the end surfaces of the fuse body 23 and the inner end walls 29 of the fuse box.

These end walls 29 and the horizontal partitions 33 furthermore comprise a slot 35 each allowing insertion of the terminal legs of the fuse for engaging a contact piece 16 each.

The fuse boxes 17, 19, and 21 may be fastened to the breaker box 11 by means of screws or suitable snap-action device; this is not illustrated in the drawing.

Each fuse box comprises a barring pin 41, 43, and 45, respectively, situated in the same horizontal and vertical plane and resting in suitable recesses in the side walls of the fuse boxes at a level between a horizontal partition 33 and the upper end of a contact piece 16. The barring pins can be moved between the two outermost positions by means of a suitable manoeuvring means, e.g. an appropriately formed cam disc 47 placed on the axle 13 of the handle. In the situation shown in Fig. 1 all barring pins are in neutral position, where they do not bar the access of a terminal leg to a contact piece, e.g. through the slot opening 35. In this situation the switch is disconnected and in its out-position, and the fuses can unimpededly be removed and inserted. If on the contrary the switch is connected, i.e. in its in-position, the cam disc 47 has manoeuvred all barring pins to the barring position as illustrated in Fig. 2. This takes place under the sur-

mounting of small spring forces from the springs 51, 53, and 55 ensuring the return of the pins to the neutral position when the switch is disconnected. It should be noted that as far as the two adjacent fuse boxes - which in the drawing are positioned to the right of the handle axis 13 - are concerned, the outer barring pin 45 is indirectly influenced through the inner barring pin 43.

In the barring position the barring pins project in such a manner over the slot spaces for one of the terminal legs of the fuses that the pins can neither be inserted nor removed when the switch is connected. The combination of the narrowed passages of the fuses and the stop by means of the barring pins involves an increased personal security, as it is impossible when the switch is connected to come into contact with live parts. With the establishment of the fuse boxes according to the invention it will not be possible either to edge the fuses in or out; the space is too narrow for that, cf. the illustration in the left part of Fig. 3. It is of no importance in this connection whether the barring pins are on the input or output side.

Each fuse box is furthermore covered by a specially formed cover according to the invention as illustrated in Figs. 3, 4, and 5. The cover, provided with the general reference number 60, abuts the upper edge of the outer box walls 27 with an edge flange 61, cf. Fig. 3.

A central section 63 of the cover is opened in the side walls to form a handle and is on the underside constructed with open cells separated by partitions 65. In each end the cover is provided with carrier pins 67 for engaging eye-shaped fuse vanes 69, which by way of standard are provided at the ends of the fuse body 23 of each fuse. A closing handle 71 is provided in one end wall of the cover opposite a carrier pin 67 through suitable recesses in

the end wall and on the top side; the closing handle may be bent outwards, away from the center of the handle or the cover, the cover being made of a material sufficiently elastic to make such a deflection possible. The closing handle 71 is furthermore provided with a downwardly projecting nose 73 for cooperation with a fuse vane 69 as illustrated in Figs. 4 and 5, which are a longitudinal sectional view of the cover 60 and a sectional view of the fuse.

The situation immediately before the coupling of the fuse and the cover/handle is illustrated far to the left in Fig. 4; in the next situation the nose 73 is pressed in upward direction by the fuse vane 69, and the closing handle 71 is bent outwards from its normal position or rest position. The carrier pins 67 are hereby allowed to engage the fuse vanes 69 by pushing the fuse to the right, cf. situation No. 3 in the Figure, and when the fuse vane is free of the nose 73, the closing handle 71 slides back into its rest position and bars the fuse vanes in such a manner that the fuse cannot be displaced to the left on the carrier pins, cf. situation No. 4. The connected parts can now be inserted into the fuse box, and when the fuse with its terminal legs 35 engages the contact pieces 16 and the cover with its edge flange 61 rests on the upper edges of the side wall, the closing handle 71 is barred so that the cover cannot be removed without simultaneous removal of the fuse. When the switch is connected this will, however, be prevented by the barring pins 41, 43, and 45, and complete security against contact with live parts has thus been established by means of the system here described.

As mentioned in the introduction this involves a reduction of the costs of construction in connection with the establishment of switch boards, it not longer being necessary to have a door for each switch. The location of several

switches behind the same door can now be permitted. This implies in turn that the switch board is more easily serviced.

The construction of the cover further allows the removal of a hot fuse without it being touched, as the closing handle 71 after removal from the fuse box in question is easily bent outwards by a push with a thumb, whereafter the fuse is capable of sliding off freely, if the handle is tilted at a suitable angle.

The invention has been explained above with reference to DIN-standardized knife fuses, but there is nothing to prevent the principles of the present invention from being used in connection with other similar fuses.

Claims.

1. A safety device for use in connection with power switches of a type known per se and comprising a substantially box-shaped breaker box with a number of one-sidedly located contact pieces which are in pairs intended to secure a fuse formed as a fuse body and two opposite terminal legs extending therefrom, c h a r a c t e r i s e d in that the device comprises a number of fuse boxes (17, 19, 21) for individual fastening on the breaker box (11) and for shielding a set of contact pieces (16) with associated fuse (23, 25), a number of barring pins (41, 43, 45), one for each fuse box, displaceably located in the longitudinal direction of the breaker box (11) against the effect of a spring (51, 53, 55) between a neutral position and a barring position, as well as a manoeuvring unit (47) for collective operation of the barring pins either directly or indirectly, so that said barring pins in the in-position ("I") of the switch have been manoeuvred to said barring position and in the out-position ("O") of the switch to said neutral position, and in which each fuse box on the inside is constructed with inner walls (29, 31, 33) in such a manner that the fuse (23, 25) concerned is given as narrow a passage as possible, which makes an oblique mounting of the fuse impossible, and in which the barring pins (41, 43, 45) in the barring position make the removal of a fuse from, alternatively the insertion of a fuse into its respective contact pieces (16) impossible.

2. A safety device as claimed in claim 1, c h a r a c t e r i s e d in that it further comprises a cover (60) for each fuse box, said cover having a handle portion (63), a rigid and manually operated closing handle (71) which is resiliently movable from a rest position and which is provided in one end for cooperation with one of the fuse vanes (69) placed on the fuse body (23) and having carrier pins (67) situated on the underside for engaging said

fuse vanes for carrying said fuse, and besides said closing handle (71) in a rest position bars the unintended sliding off of a fuse vane from a carrier pin.

3. A safety device as claimed in claim 2, c h a r a c - t e r i s e d in that the closing handle (71) is constructed for self-barring when the cover (60) has been mounted.

Fig. 1

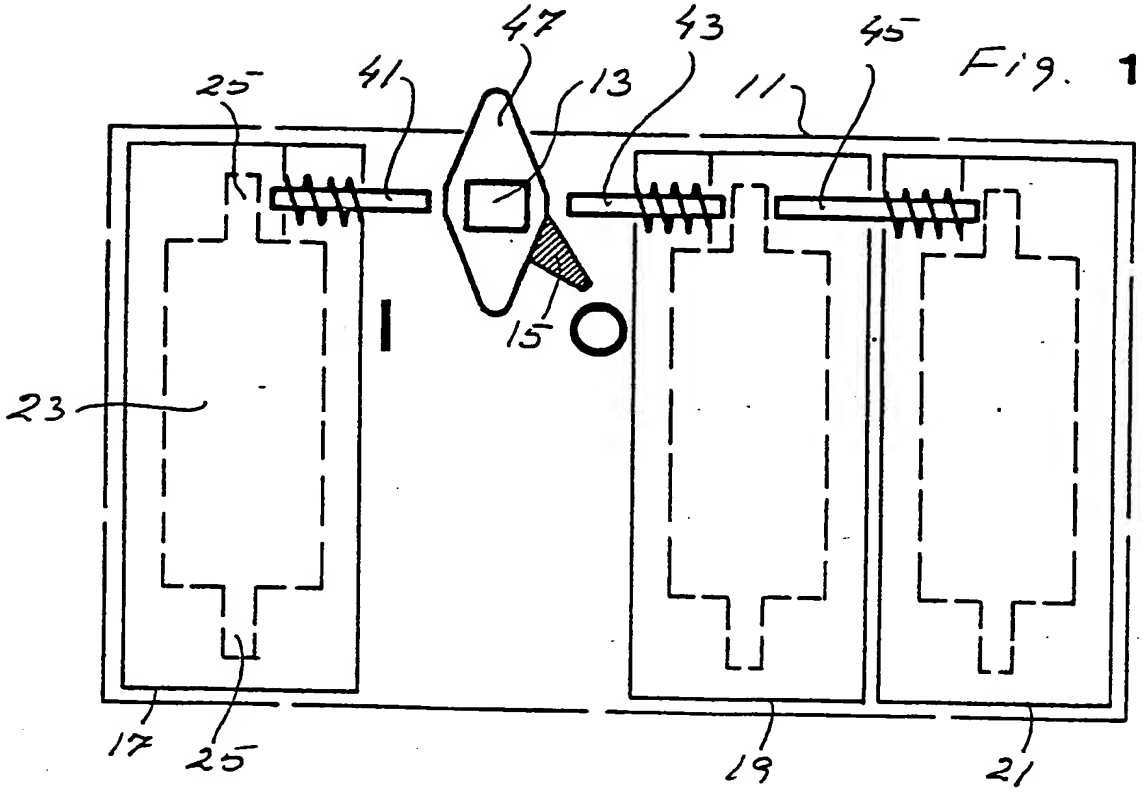
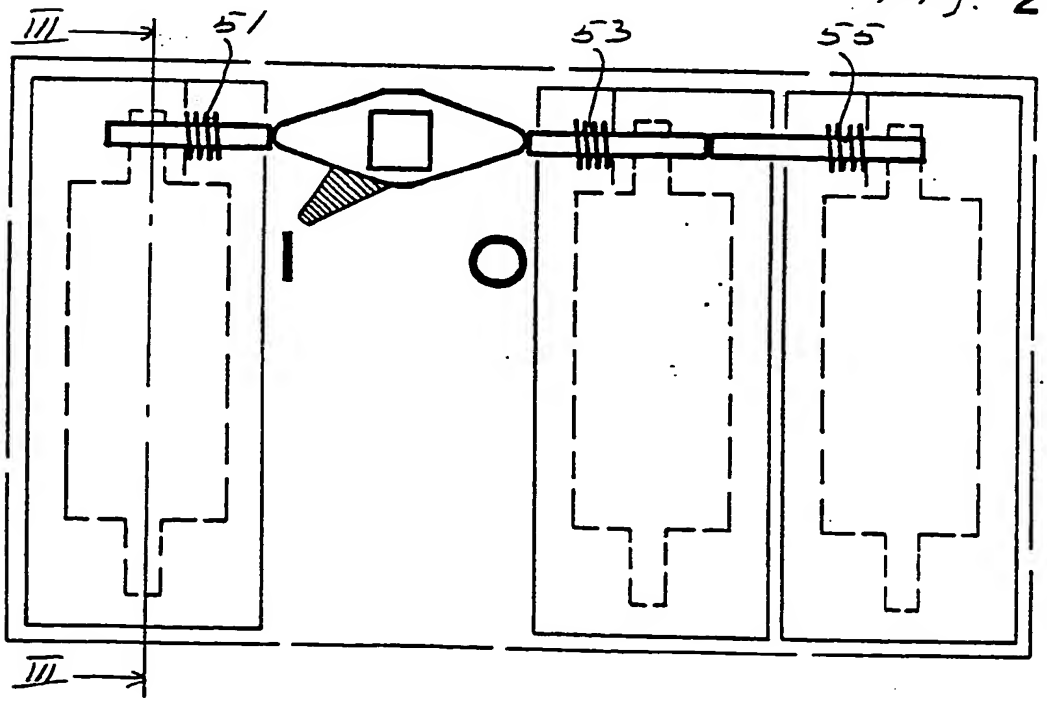


Fig. 2



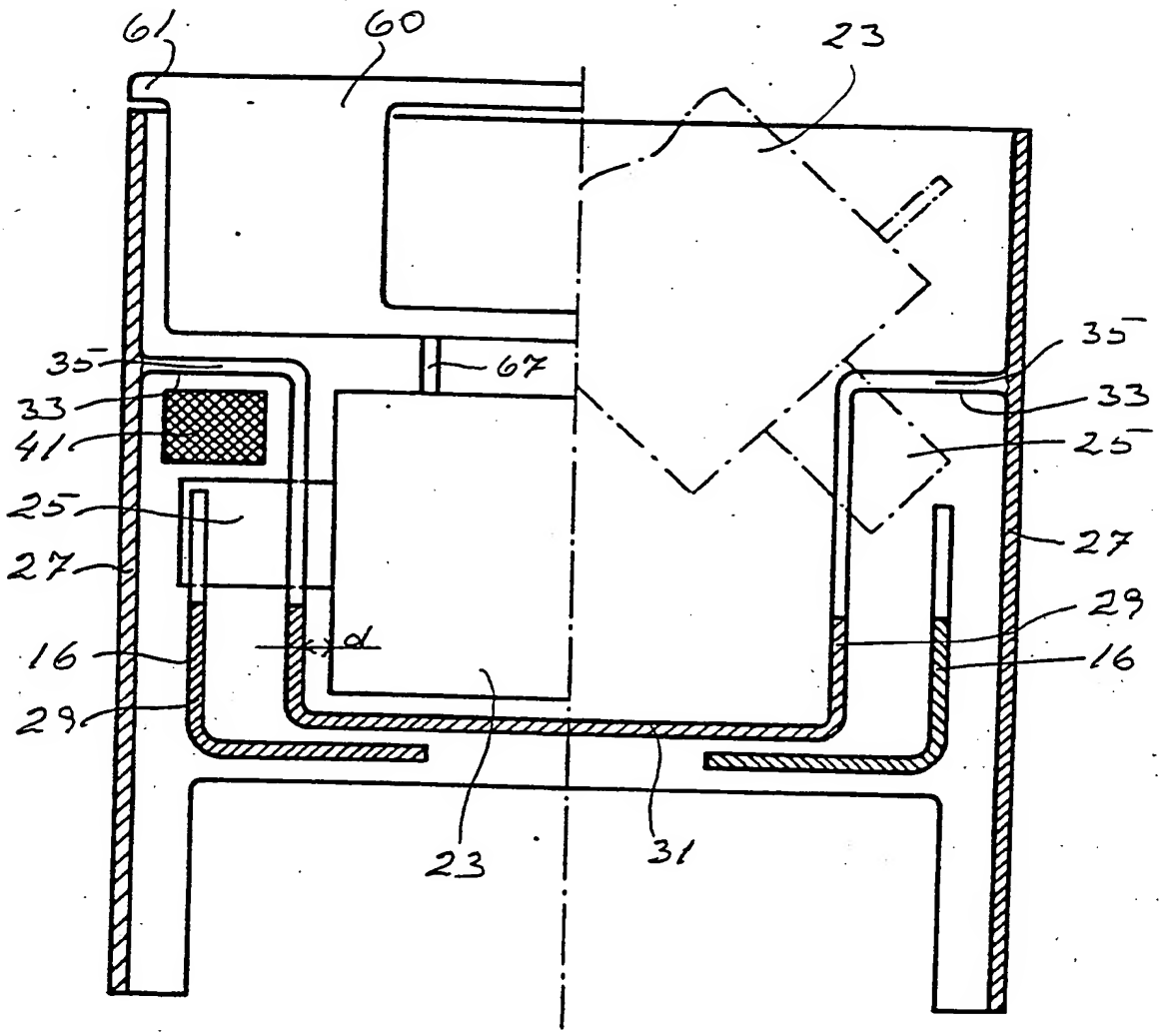
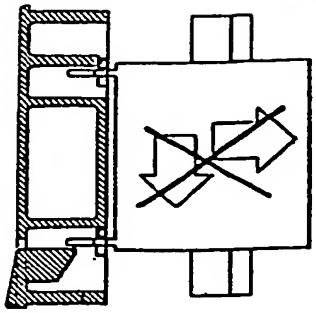


Fig. 3



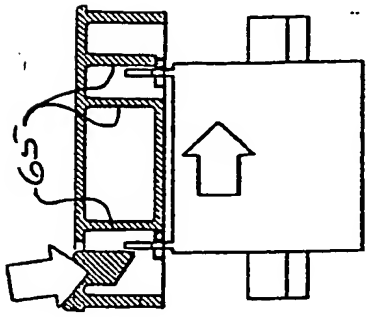


Fig. 4

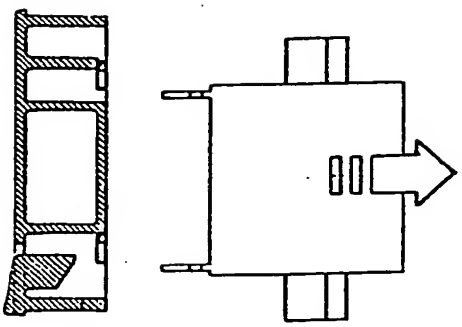
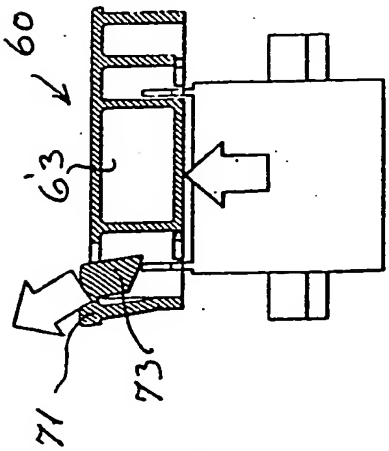
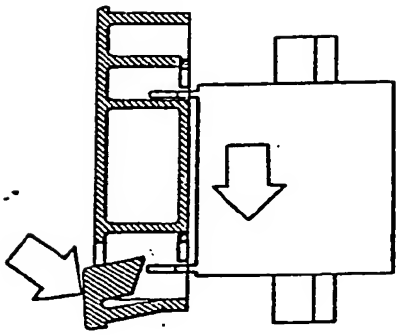
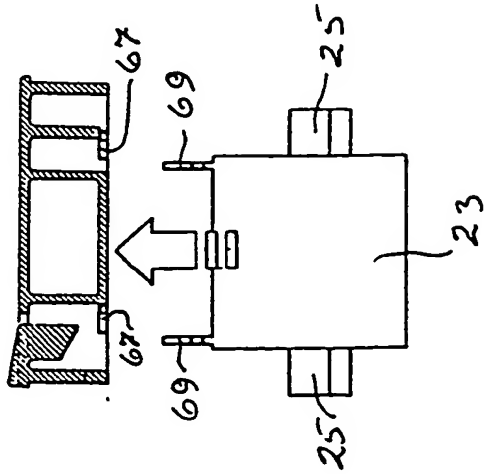


Fig. 5







INTERNATIONAL SEARCH REPORT

International Application No PCT/DK86/00041

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

H 02 B 1/18

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	H 01 H 9/10, /20-/26, 31/04-/12, 85/00, /02, /20, /22, /54-/60; H 02 B 1/18
Nat Cl	21c:41/01; 21c:70 .../...

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	US, A, 2 342 852 (W.H. FRANK) 29 February 1944	1
A	DE, B, 1 150 434 (SOCIETÀ PER AZIONI BASSANI) 20 June 1963	1
A	NO, B, 145 036 (LINDNER GMBH) 14 September 1981	1
A	DE, C, 361 514 (VOIGT & HAFFNER AKT.-GES.) 16 October 1922	1
A	GB, A, 859 084 (THE ENGLISH ELECTRIC COMPANY LIMITED) 18 January 1961	1
A	SE, A, 219 225 (ALLMÄNNA SVENSKA ELEKTRISKA AB) 27 February 1968	2
A	DE, B, 1 069 270 (SIEMENS-SCHUCKERTWERKE AKTIENGESELL-SCHAFT) 19 November 1959	2

* Special categories of cited documents: [10]

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"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1986-07-08	1986 -07- 14
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Bertil Nordenberg

Form PCT/ISA/210 (second sheet) (January 1985)

L.E

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II Fields Searched (cont).

US Cl 200:50;
337:4;
361:343-349, 357, 360

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers ....., because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers ....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers ....., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.

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